

Interpreting Hundness with X-ray spectroscopy: a missing piece of the many-body picture

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The Hund's rules are central to our understanding of how electrons interact to align angular momentum on the same atom. However, their role in many-body systems (sometimes called "Hundness") can be phenomenally difficult to evaluate. I will talk about our recent investigation of several materials poised at the crossover between electronic localization and itinerancy, and show that Hundness can be a key factor for establishing interesting low-temperature phases in such an environment. The talk will focus in particular on our studies of the 'hidden order' state of URu₂Si₂ [1], the metal-insulator transition of VO₂ [2], and a 'singlet-based' magnetic phase we have recently discovered in USb₂ [3]. Our experimental characterization of Hundness involves resolving and manipulating electronic symmetries on the atomic scale, and is greatly facilitated by ongoing advances in X-ray spectroscopies such as resonant inelastic X-ray scattering (RIXS).

References

[1] L. Andrew Wray *et al.*, Phys. Rev. Lett. **114**, 236401 (2015).

[2] Haowei He *et al.*, Phys. Rev. B **94**, 161119(R) (2016).

[3] Lin Miao *et al.*, Nat. Commun. **10**, 644 (2019).